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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,041	01/29/2004	Mamoru Nakasuji	011470A	2576

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EXAMINER	
JOHNSTON, PHILLIP A	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 03/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

HA

Office Action Summary	Application No.	Applicant(s)	
	10/766,041	NAKASUJI ET AL.	
	Examiner	Art Unit	
	Phillip A. Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *58-84* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *77-84* is/are allowed.

6)☒ Claim(s) *58-76* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to amendment filed 12-27-2005, wherein claims 1-57 were previously canceled, claims 58,60-62,65 and 66 have been amended. Claims 77-84 are allowed. Claims 58-84 are pending.

2. The examiner agrees that in view of the amendments to claims 58,60-62,65 and 66, the obviousness-type double patenting rejection of claims 58-76 in the previous office action is withdrawn.

Claims Rejection – 35 U.S.C. 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 58, 60-62, and 68 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,038,018 to Yamazaki, and Richardson, U.S. Patent No. 4,864,228.

Yamazaki (018) discloses an electron beam inspection apparatus that includes the following;

(a) An electron gun for emitting a plurality of electron beams, spaced apart at equal intervals to scan a semiconductor wafer, and a deflector 27 for deflecting secondary electrons toward the secondary optical system, that incorporates an E x B

filter above the objective lens system 14, having coils 41a and 41b, equivalent in the shape of a toroid as recited in claims 58, 61, and 68. See Column 10, line 42-55; and figure 9 below;

(b) Imaging with a TDI-CCD detector synchronized with stage movement, as recited in claim 60. See Column 7, line 56-62;

(c) When the sample 11 is irradiated with the primary electron beams 31, the secondary electrons, the reflected electrons and the backward scattered electrons, are emitted from the surface of the wafer 11. The rotation-symmetry type electrostatic lens 14 generates an acceleration electric field, so that the electrons are led and thereafter accelerated in the direction perpendicular to the surface of the sample 11, as recited in claim 62. See Column 6, line 11-32;

(e) Beam intensity detection and control, as recited in claim 61. See Column 9, line 20-23;

5. Claim 59 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (018) and Richardson (228), in view of Nakagawa, U.S. Patent No. 4,431,915.

The combination of Yamazaki (018) and Richardson (228) fails to teach a saddle shaped deflector coil. However, Nakagawa (915) discloses an electron beam apparatus that includes saddle shaped deflection coil 20. See Column 2, line 54-61.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018) and Richardson (228), can be modified to use the saddle shaped deflector of Nakagawa (915), to

provide a deflection coil where the degree of electron beam deflection in the direction X and Y, is equalized for easy selection and control of deflection signals in rotating an image based on scanning rotation, thereby providing an electron beam apparatus free from specimen image shift.

6. Claims 63-67, and 69-76 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (018), and Wada, U.S. Patent No. 6,586,753 in view of Petric U.S. patent No.4,528,451, and in further view of Tanaka, U.S. Patent No. 6,509,957.

Yamazaki (018), as described above discloses nearly all the limitations of claims 63-67, and 69-76 including;

(a) Defect detection and image processing by image comparison, as recited in claim 69. See Column 5, line 39-57; and Column 13, line 3-18;

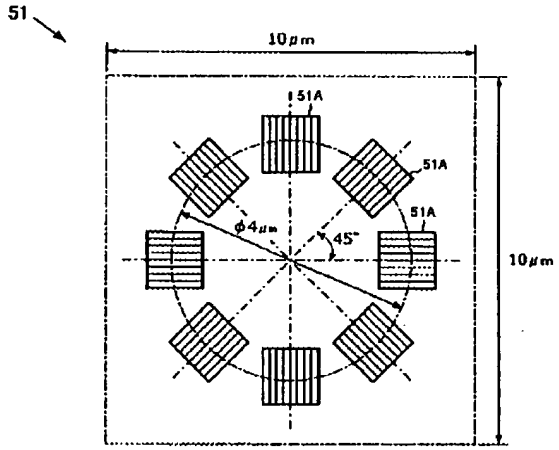
(b) Voltages applied to the wafer surface using power source 45, as recited in claim 67. See Column 2, line 6-23; Column 6, line 56-64;

(c) Performing wafer inspection, as recited in claims 75 and 76. See Abstract.

Yamazaki (018) fails to teach an electron beam apparatus having a plurality of particular patterns selected and used to determine the beam diameter that provides the maximum S/N ratio. However Wada (753) discloses an electron beam apparatus having reference cell 50 that includes plural test patterns 51 with plural line and space patterns 51A, where during irradiation of target 50, the output is detected to measure and adjust beam diameter, focus, astigmatism, and beam axis compared to

predetermined (stored) values, as recited in claims 63-66, and 69. See Column 6, line 11-45; and Figure 5 below.

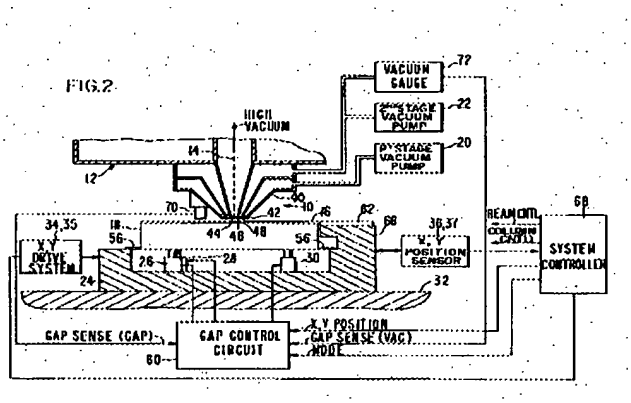
Fig.5



Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018), can be modified to use the reference pattern of Wada (753), to provide an electron beam apparatus that is designed to provide a predetermined beam diameter, a precise adjustment required for an optical axis (electron beam axis) for achieving the design performance.

The combination of Yamazaki (018) and Wada (753) fails to teach the use of a partition for reducing conductance and the use of differential pumping for evacuating the irradiated region on the sample surface, as recited in claims 70 and 72. However, Petric (451) discloses an envelope apparatus 10 that provides a partition between vacuum zone 44 and the working chamber, where the envelope apparatus 10 includes annular aperture 48, which is coupled to the first stage vacuum pump 20, which reduces the pressure (differentially pumped) around the vacuum zone 44 to a low vacuum level. See Column 4, line 52-68; and Figure 2 below.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018) and Wada (753), can be modified to use the differentially pumped vacuum envelope of Petric (451), to provide a low conductance gap between the vacuum tip and the wafer surface so that the irradiation vacuum zone can be differentially vacuum pumped to a low vacuum level, thereby providing the required vacuum level for wafer processing.



The combination of Yamazaki (018), Wada (753), and Petric (451) fails to teach the use of a loader for supplying a sample to the stage apparatus and the use of dry nitrogen in the hydrostatic bearings, as recited in claim 74. However, Tanaka (957) discloses in FIG. 3, a wafer loader compartment 48 having an inner loader chamber 46 is disposed adjacent to the compartment 42 that has the wafer chamber 40.

The wafer stage is supported by a hydrostatic bearing and a hydrostatic pressure of pressurized gas (e.g., helium or nitrogen gas, or the like) emitted from the bearing surfaces of the vacuum preload hydrostatic bearing devices. See Column 15, line 3-8; Column 23, line 46-60.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018), Wada (753), and Petric (451), can be modified to use the stage device of Tanaka (957), to provide a wafer stage that is non-contactingly supported with approximately several microns of clearance above the moving surface, where the wafer replacement shock force is eliminated, thereby preventing generation of a positional shift to an object mounted on the moving member.

Examiners Response to Arguments

7. Applicant's arguments filed 12-27-2005 have been fully considered but they are not persuasive.

Argument 1

Applicant states that, "Independent claim 58 has been amended to specify "a lens and a deflector for deflecting the secondary electrons between the beam separator and the detector." The cited art fails to teach or suggest the features of amended claim 58. Accordingly, it is believed that the amended claims have overcome the above-noted rejections."

The applicant is respectfully directed to Yamazaki (018), Figure 9 below; and Column 10, line 42-55, which states; The magnetic field type energy filter 46 permits a secondary electron beam 32a, having a high energy component, among the secondary electron beams 32 to travel straight, and the this secondary electron beam 32a is detected by an electron beam detecting unit 61. Further, the magnetic field type

energy filter 46 deflects at a large angle a secondary electron beam 32b having a low energy component. This deflected electron beam 32b is guided to an electron beam detecting unit 62, by which image data of the lower energy component thereof is detected.

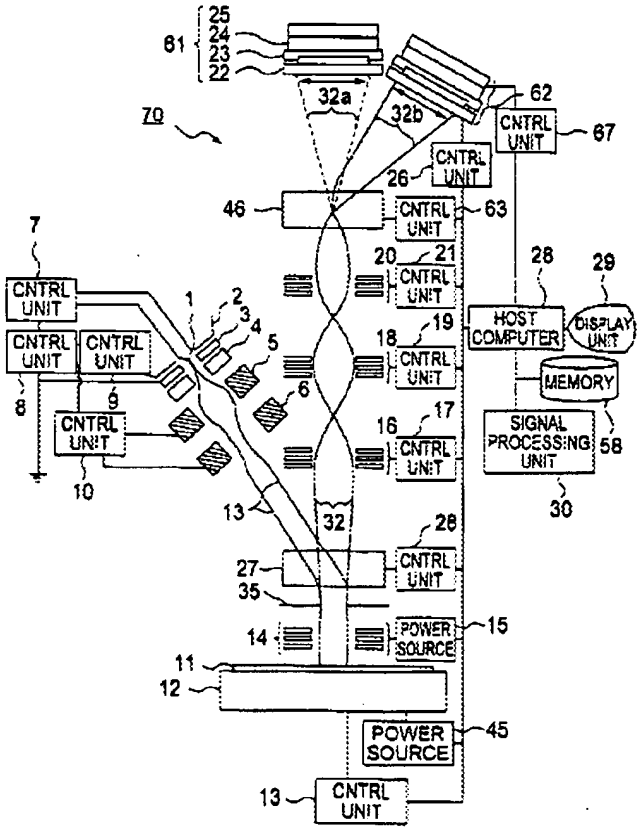


FIG. 9

The examiner has interpreted from the Yamazaki (018) references above that a lens' 16,18,20 and a deflector are located between the beam separator 27 and the detectors 61, 62.

Argument 2

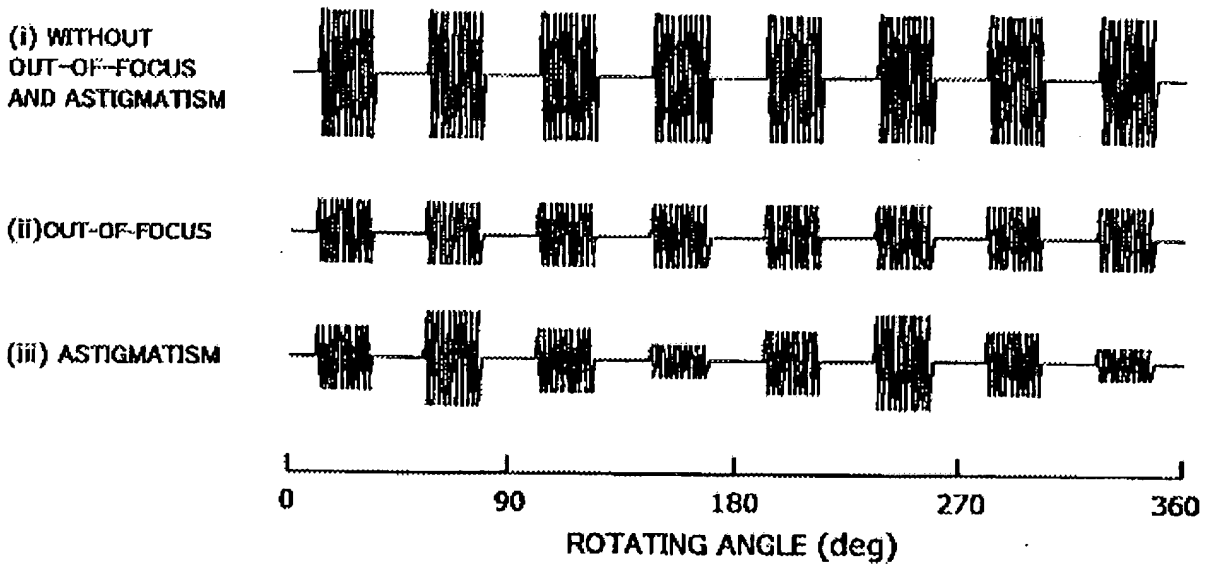
The applicant states that " Claim 63 contains the limitation "mechanism for adjusting a beam diameter and a beam current of the primary electron beam to maximize an S/N ratio in a particular pattern in an electric signal of the secondary electron beam detected by said detector, wherein the beam diameter and the beam current are adjusted by changing a brightness of the electron gun, and the electron beam apparatus has a plurality of particular patterns, one of which is selected and used to determine the beam diameter providing the maximum S/N ratio".

Wada describes a technique that a beam diameter, astigmatism, and a beam axis are adjusted using a plurality of test patterns. However, Wada does not disclose that both of a beam diameter and a beam current are adjusted to maximize an S/N ratio. None of the other references discloses it, either. "

The applicant is respectfully directed to Wada (753), Figure 13 below; and Column 7, line 15-43, which states; The SEM signal generated when the electron beam is rotated once along the circumference is displayed on an oscilloscope. FIG. 13 schematically shows the waveform of the SEM signal, i.e., (i) when there is no defocusing and astigmatism; (ii) when there is defocusing; and (iii) when there is astigmatism. When the beam diameter is equal to or smaller than the dimensions of the line-and-spaces, the signal amplitude is maximal. Therefore, the signal amplitude is maximal (i) when there is no defocusing and astigmatism, in which case the signal amplitudes from the respective line-and-spaces 51A are substantially equal. (ii) When there is defocusing, the signal amplitude becomes smaller as the beam diameter is

larger than the dimensions of the line-and-spaces. (iii) When there is astigmatism, the signal amplitude from the respective line-and-spaces 51A varies. Therefore, it can be rapidly distinguished and determined from fluctuations in the signal amplitude whether either defocusing or astigmatism, or both should be adjusted.

Fig.13



The examiner has interpreted from the Wada (753) references above, that SEM signal amplitude, which is a measure of beam intensity or beam current, is clearly performed by Wada (753) and is utilized as a measure of beam diameter.

The examiner has also interpreted from the Wada (753) references above that monitoring SEM signal amplitude in accordance with Wada (753) is equivalent to

applicant's measurement and adjustment of beam diameter as determined by a detector signal output, as described in paragraph's [0286] through [0297] of applicants published application.

Conclusion

8. The Amendment filed on 12-27-2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the references cited in the Office Action mailed 9-30-2005.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 6:30 am to 3:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee

can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ
March 7, 2006

JOHN R. LEE
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